



TOWARD A HEALTHY GREAT LAKES – ST. LAWRENCE ECOSYSTEM

CLEAN WATERS

This brochure is produced to help you understand some of the problems facing the Great Lakes - St. Lawrence ecosystem, especially pollution by toxic substances. It also explains what is being done, particularly by the Canadian Government, to clean up and restore this ecosystem to a healthy state.

We focus mainly on the Great Lakes. But the lakes and rivers are linked and need to be seen as an ecosystem in which air, water, wildlife, people and pollution move readily.

This publication refers largely to work of the Canadian Government but also to that of other governments in Canada and the United States. Readers are urged to contact Canadian and other government agencies, businesses and non-government groups for more detailed information.

A list of contacts is found at the end of this brochure.



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THE GREAT LAKES - ST. LAWRENCE A DAMAGED ECOSYSTEM

"... to restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin ecosystem."

—from the 1978 Canada - United States
Great Lakes Water Quality Agreement.

THE GREAT LAKES - ST. LAWRENCE basin is one of the greatest fresh water systems in the world.

The lakes are so vast that early explorers called them Sweetwater Seas. They hold nearly one-fifth of the fresh water flowing on the Earth's surface.

Their headwaters begin in the middle of the continent and flow as far as 3,800 kilometres to the Atlantic Ocean in a voyage that can take two centuries. On that journey they shape the lives and futures of eight million Canadians.

You and I are part of the journey of those waters as we are part of the ecosystem. We draw water into our homes where we drink it, cook with it and bathe in it. Then we drain it back into the lakes, through vast sewer systems and treatment plants. The water reaches us in other ways. It evaporates into the sky to fall as rain on our forests and food crops and provides moisture in the air we breathe.

This ecosystem that supports our life has been polluted by years of careless human development.

Now a success story, Lake Erie was said to be dying from pollution, during the 1960s and 1970s. In fact, it was becoming excessively alive as phosphorus pollution from sewage, detergents and phosphate fertilizers accelerated the growth of green algae. When algae dies the waters become low in oxygen choking out other forms of life, including some fish.

Concentrated efforts by Canada and the United States to reduce phosphorus inputs through

improved sewage treatment and banning phosphates in laundry detergents reversed the problem. Today Lake Erie supports a vibrant commercial sport fishery.

Today we are finding that chemical pollution in the Great Lakes can be directly linked to massive reproductive failures in wildlife, particularly in fish-eating birds such as eagles, gulls and cormorants. In a series of rescue missions over the last 30 years we have attacked one form of pollution after another, building and improving sewage treatment plants and banning or limiting the use of many toxic chemicals. But the battle against pollution is not over. Some fish are unsafe to eat and some wildlife is still born with deformities or has trouble reproducing.

Chemical pollution is still finding its way into the Great Lakes. Part of it comes from our industries. Some of it comes from our own households. Many of us empty chemical containers or wash paint brushes in sinks. We also spray chemicals onto our lawns and gardens. These residues are washed into creeks and storm sewers that drain to the lakes.

If we intend to clean up the Great Lakes and restore a healthy ecosystem we will have to adjust to lifestyles and business practices that allow both a healthy environment and a healthy economy. It is a way of living that a growing number of people call sustainable development. ■



POLLUTION SOURCES AND ECOSYSTEM HEALTH

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WATER POLLUTION CAN COME FROM many unexpected sources including long-range air pollution from industrial smokestacks and incinerators, as well as some pesticide sprays picked up by the winds and carried across continents. Studies by Environment Canada estimate that several tonnes of airborne pollutants rain down on the Great Lakes basin each year.

Large amounts of hazardous chemicals wash off the land. Sources include improper or inadequate sewer systems, cars, our pets, our farms and land that has been contaminated by careless storage of hazardous materials.

Great Lakes pollution is also caused by spills, emptying tonnes of harmful material into the lakes. In 1988 the Ontario government's Spills Action Centre reported over 300 spills of oils, chemicals, wastes and other contaminants into the Great Lakes and tributaries. The U.S. Coast Guard reported an average of more than 500 spills a year on its side of the lakes during the 1980s.

IMPLICATIONS FOR ECOSYSTEM HEALTH, INCLUDING HUMANS

Several of the chemicals found in the ecosystem have been linked with reproductive and developmental problems in wildlife.

People often believe that cancer is the biggest hazard from toxic chemicals. Great Lakes scientists say that there may be a greater risk from the effects of

chemicals on the nervous system, fertility, the development of young and reduced immunity to disease.

Studies show that sixteen Great Lakes - St. Lawrence wildlife species have suffered reproductive problems or declines in populations since the 1950s. They include 10 fish-eating bird species, the beluga whale, mink and otter, lake trout, sauger and snapping turtle. In each case, high levels of at least one chemical were found in the animals, their eggs or offspring.

In past decades the Great Lakes herring gulls and double-crested cormorants were among the most contaminated birds in the world. Both species, particularly the cormorants, suffered major reproductive failure and there were deformities in some birds that did hatch. Laws instituted in the 60s and 70s caused most pollution levels to drop in recent years and the populations of fish-eating birds are rebounding. There are still deformities in some hatchlings in highly-polluted parts of Saginaw Bay in Lake Huron and Green Bay in Lake Michigan.

Some species, such as mink living along shorelines of Lake Ontario, and lake trout from Lakes Ontario and Michigan appear to have difficulty reproducing in their natural habitat. Studies suggest this is linked to PCBs in their environment.

Turtles from parts of the lower Great Lakes and the St. Lawrence River have accumulated levels of PCBs and related chemicals and they also have high numbers of dead or deformed embryos. The

CHANGING THE ECOSYSTEM

The ecosystem has been altered not only by pollution but by tampering with the physical structure of the lakes and by the introduction of exotic species.

- Many of the marshes that marked the boundary between river and lake have been cleared to make room for harbors and marinas, eliminating breeding grounds and habitat for fish, birds and many animals.
- The sea lamprey, an eel-like creature, has attacked the lake trout, whitefish, chub, lake herring, cisco and burbot from the lakes during the 1930s and 1940s. Chemical treatment has kept the lampreys in check but has not eliminated them. So far control measures have cost over \$100 million with no end in sight.
- The zebra mussel, which blankets hard surfaces like rocks and pipes, was first found in Lake St. Clair in 1987 and quickly spread throughout the Great Lakes. This striped mollusc will likely be accidentally carried to inland waters. The thumbnail-sized shellfish probably hitched a ride into the lakes in ballast water that a freighter picked up in Europe and discharged here. Already the mussels have clogged water intake pipes in Lake Erie and threaten to smother the spawning grounds of fish and compete with other lake dwellers for floating algae in the lakes.
- Other fish species have been introduced to the lakes, such as the alewife and species of salmon, competing with native fish for food and habitat.

THE INTERNATIONAL JOINT COMMISSION (IJC)

The International Joint Commission, a six-member body appointed by the Canadian Prime Minister and the President of the United States to advise the two nations on boundary water issues, reports regularly on the state of the lakes.

They have positively identified 362 pollutants that have been found at times in the water, sediments, fish, animals and waterfowl — 32 metals, 68 pesticides and 262 organic chemicals, including industrial substances and waste byproducts. Eleven of the 362 have been singled out by the IJC as critical or priority pollutants because they are persistent and can accumulate in fish, harm fish and wildlife or can threaten human health.

The IJC has identified 42 Areas of Concern for special attention and cleanup. Seventeen of these are in Ontario, including five in the boundary rivers that connect the Great Lakes and are shared with the United States.

small, white beluga whales of the St. Lawrence estuary, already an endangered species because of overhunting in years past, now appear to be dying off. Their bodies carry some of the highest pollution levels of any animal on the continent.

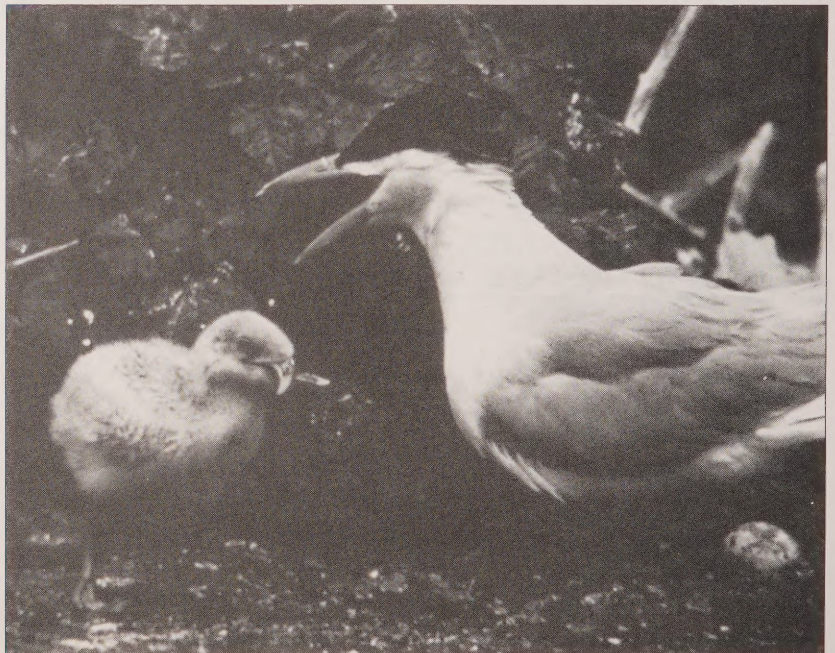
Human tissue studies have found that many of the toxic chemicals found in the ecosystem also turn up in our bodies. However, the human samples taken so far have found that most people living around the Great Lakes basin do not have higher levels of pollutants in them than people in other industrialized parts of North America. Further studies are planned to get a clearer picture of chemical contaminants in our bodies.

We know of at least one group of people who have been affected by higher than normal levels of pollution. The people studied

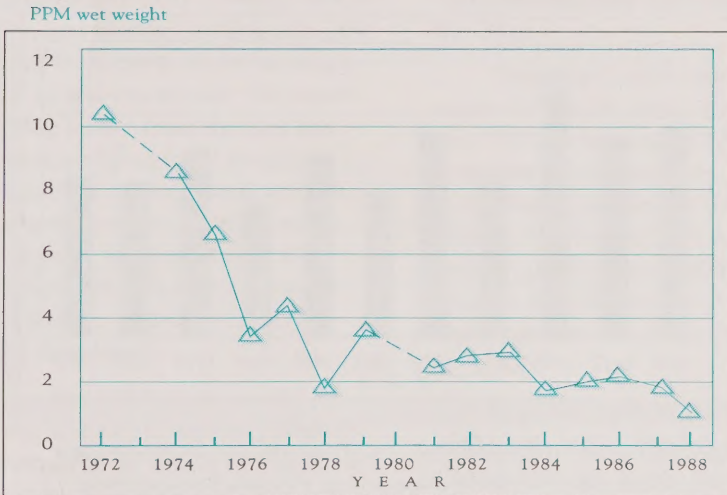
regularly ate contaminated fish from Lake Michigan. The children of mothers who ate an average of 6.7 kilograms (15 pounds) of contaminated fish a year from Lake Michigan were born smaller than average. At age four the children had poorer memories than normal youngsters, based on psychological testing.

This research appears to confirm evidence in wildlife that links exposure to some contaminants in the environment to harmful health effects.

The risks from pollution in the Great Lakes food chain are not new. Contamination by mercury and hazardous chemicals like PCBs, mirex and dioxins have forced periodic closures of some commercial fisheries or warnings against eating sport fish in each of the Great Lakes, Lake St. Clair and the connecting rivers for two decades. In recent years, the



Lake Ontario Credit River PCBs



PCB concentrations in lean dorsal muscle tissue of Coho Salmon collected from the Credit River, Lake Ontario. SOURCE: Ontario Ministry of the Environment & Ontario Ministry of Natural Resources, 1987 (unpublished data)

number of restrictions has declined in some areas, but health experts say that people should adhere to guidelines for sport fish consumption published by governments. Commercial fish must meet government safety standards before being sold.

Over the years there has also been a heated debate about the safety of drinking water from various parts of the lakes. Studies of treated tap water around the lakes have found contaminants to be within maximum acceptable guidelines. But the fact that dozens of chemicals and metals may be in the water has caused great concern among citizens and sparked an ongoing debate as to how to reduce their levels.

Although the definitive studies on the health effects on humans of toxic chemicals in the lakes have

yet to be done, senior advisors are issuing strong warnings that we need to do a better job of cleaning up in order to reduce risks.

The Great Lakes Science Advisory Board to the International Joint Commission said in 1989 that: "it is reasonable to presume that toxic chemical exposures are adversely affecting human health. The effects may not be life-threatening at a personal level, but may have a significant effect on the health of our children." This statement was reinforced in 1990 when the IJC commissioners said that even the relatively low levels of toxic chemicals in the Great Lakes ecosystem can pose a threat to the health of children. They called for "every available action" to eliminate the flow of toxic substances into the Great Lakes. ■

ELEVEN CRITICAL POLLUTANTS IN THE GREAT LAKES

— from the list of the Great Lakes Water Quality Board of the International Joint Commission.

- PCBs (industrial chemicals used in electrical and hydraulic equipment)
- DDT and its breakdown products (pesticide)
- dieldrin (pesticide)
- toxaphene (pesticide)
- dioxin (2,3,7,8-TCDD) (combustion byproduct)
- furan (2,3,7,8-TCDF) (combustion byproduct)
- mirex (pesticide, industrial chemical)
- mercury (industrial metal)
- benzo(a)pyrene (B(a)P) (combustion byproduct)
- hexachlorobenzene (pesticide and combustion byproduct)
- alkylated lead (gasoline additive)

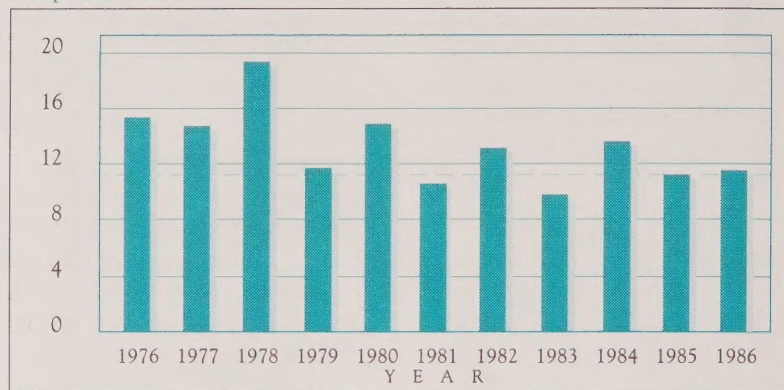
WHAT HAS BEEN DONE ABOUT THE POLLUTION

"...boundary waters and water flowing across the boundary shall not be polluted on either side to the injury of health or property on the other side."

— from the 1909 Boundary Waters Treaty between Canada and the United States.

Lake Erie - Total Phosphorus Loading

Phosphorus load – thousands of tonnes



The target load for Lake Erie is 11,000 tonnes per year. Annual loads are based on estimates of the total of atmospheric, industrial, municipal and tributary phosphorus inputs. Great Lakes Water Quality Board Report on Great Lakes Water Quality, 1987.

POLLUTION PROBLEMS ARE OLD ENOUGH and serious enough to have been part of a treaty signed more than 80 years ago. That treaty presaged today's concern that pollution respects no boundaries. Since then, Canada and the United States have signed a series of agreements aimed at restoring the lakes to good health.

The 1972 Great Lakes Water Quality Agreement, the first major pact, dealt mainly with phosphorus controls and sewage treatment to stop the accelerated eutrophication or "ageing" of Lake Erie and Lake Ontario.

Based upon joint scientific studies of the late 1960s, Canada and the United States agreed to reduce phosphorus inputs by setting a schedule of reduction targets to be achieved over a period of five years. At a combined cost of 13 billion dollars spent over the last twenty years building new sewage treatment plants and improving

existing facilities, the two Parties reached those targets. Experts now confirm that Lakes Erie and Ontario are no longer suffering from too much phosphorus.

In 1978 the Great Lakes Water Quality Agreement was revised to address the contamination of the lakes by toxic persistent chemicals. The renewed agreement called for the protection of the Great Lakes Basin Ecosystem expanding the protection of Great Lakes water quality to include the need to care for the air, land and all living things around the lakes. Recognizing the insidious nature of toxic chemical contamination, the Parties adopted the philosophy of zero discharge and virtual elimination for the control of toxic persistent substances, in spite of scientific uncertainties regarding the measurement of minute concentrations and the long-term effects of these substances in the environment and human health.

The research surveillance and control activities carried out under the 1978 Agreement recognize the full extent of toxic chemical pollution and sources, underscoring the need for a comprehensive attack on all sources of toxic chemicals to the lakes. Over the past few years environmental groups, academic organizations and the government have conducted extensive reviews of the 1978 Agreement. These results were added as a detailed Protocol to the Agreement.

The 1987 revisions include new annexes to address pollution from airborne toxics, contaminated sediments and groundwater and pollution from urban and agricultural run-off. The Protocol includes a commitment to develop Remedial Action Plans to clean up 42 severely polluted sites around the Great Lakes. In addition, the Parties agreed to develop eco-

system health objectives to ensure restoration of the entire basin ecosystem as opposed to the restoration of only the waters of the lakes.

There have been other agreements on specific areas, such as the 1987 Declaration of Intent on Pollution of Niagara River. This committed Canada, the United States, Ontario and New York, to reduce specific chemical discharges from sewers and leaking dumps to that river by at least half by 1996.

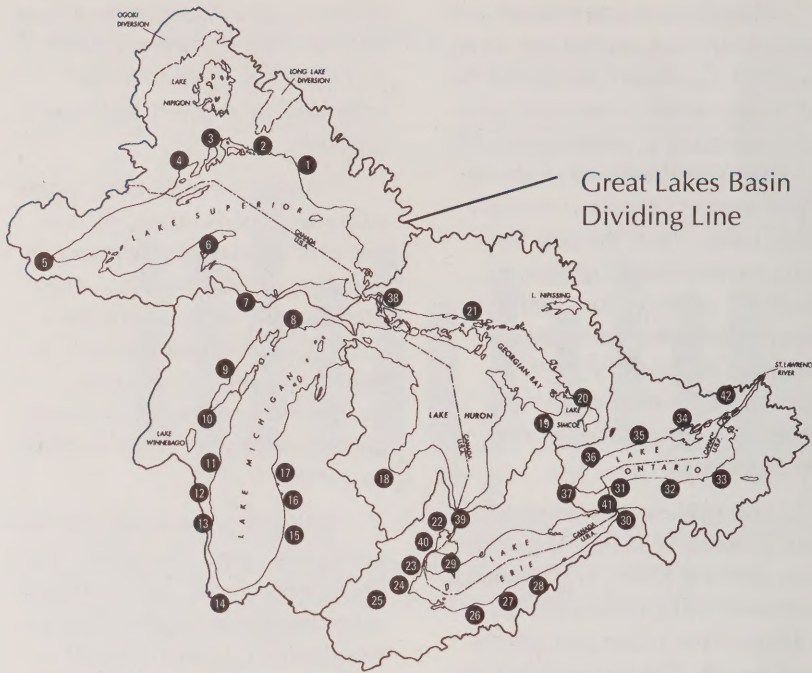
Pollution control has not been without its costs. The federal and Ontario provincial and municipal governments have spent close to \$3 billion on sewage treatment systems over the last 20 years. Some experts say that when you add spending by local governments you could double the figure. ■



"The 1978 amendments to the Great Lakes Water Quality Agreement state as their purpose, restoration of the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem. Reactive measures — regulations on discharges from existing sources, and concerted efforts to clean up hazardous waste sites — are central in efforts to achieve this goal. But, in the long run, reactive measures are not enough. The Science Advisory Board in its 1987 biennial report stressed the importance of anticipatory, preventive and adaptive strategies to assure ecosystem health within the Great Lakes basin. The Board highlighted sustainable development as a desirable goal towards which anticipatory and preventive strategies can be aimed."

— from the 1989 report of The Science Advisory Board to the International Joint Commission.

GREAT LAKES AREAS OF CONCERN



LAKE SUPERIOR

- (1) Peninsula Harbour
- (2) Jackfish Bay
- (3) Nipigon Bay
- (4) Thunder Bay
- (5) St. Louis River
- (6) Torch Lake
- (7) Deer Lake-Carp Creek-Carp River

LAKE MICHIGAN

- (8) Manistique River
- (9) Menominee River
- (10) Fox River/Southern
Green Bay
- (11) Sheboygan
- (12) Milwaukee Estuary
- (13) Waukegan Harbor
- (14) Grand Calumet River/Indiana
Harbor Canal
- (15) Kalamazoo River
- (16) Muskegon Lake
- (17) White Lake

LAKE HURON

- (18) Saginaw River/Saginaw Bay
- (19) Collingwood Harbour
- (20) Penetang Bay to Sturgeon Bay
- (21) Spanish River Mouth

LAKE ERIE

- (22) Clinton River
- (23) Rouge River
- (24) Raisin River
- (25) Maumee River
- (26) Black River
- (27) Cuyahoga River
- (28) Ashtabula River
- (29) Wheatley Harbour

LAKE ONTARIO

- (30) Buffalo River
- (31) Eighteen Mile Creek
- (32) Rochester Embayment
- (33) Oswego River
- (34) Bay of Quinte
- (35) Port Hope Harbour
- (36) Toronto Waterfront
- (37) Hamilton Harbour

CONNECTING CHANNELS

- (38) St. Marys River
- (39) St. Clair River
- (40) Detroit River
- (41) Niagara River
- (42) St. Lawrence River

REMEDIAL ACTION PLANS

In 1985 Canada and Ontario agreed to a new approach to remediate severely degraded sites around the Great Lakes by developing Remedial Action Plans for each site. There are 17 RAPs in Canada, 12 of them in Ontario alone and five conducted jointly with the United States on the rivers that connect the lakes. RAPs bring governments, businesses, environment groups and individual citizens to the table to agree on how to restore polluted areas in their regions to a healthy state. The aim is to focus local public attention on examining the problems and finding solutions based on their vision of what kind of future they want for their waters.

- RAPs are led by teams of government technical experts, who can explain the pollution problems, the health implications and the feasibility of different cleanup options.
- Public advisory committees or stakeholders are established to advise these teams. There are nearly 400 Canadians involved in public advisory committees and about 6,000 people who are keeping in touch with the RAP process.
- In some areas the pollution straddles borders. The federal, provincial and state governments are working together to develop cleanup plans along with business people and citizens.
- Responsibility for specific cleanup measures is determined. Those responsible are expected to commit to a schedule and expenditure which becomes part of the plan.
- Cleanup plans, with commitments and schedules, are to be finished for Ontario's 17 problem areas by 1993. These cleanups will cost hundreds of millions of dollars in total. We will all need to have a voice in the decisions about the choices ahead.
- Plans are submitted to the IJC where the progress and implementation are monitored. ■

THE FEDERAL ROLE

GREAT LAKES ACTION PLAN

Agriculture Canada
Environment Canada
Fisheries and Oceans Canada
Health and Welfare Canada
Public Works Canada
Transport Canada

THE FEDERAL GOVERNMENT'S ROLE in the Great Lakes - St. Lawrence cleanup is to provide overall leadership and co-ordination for the actions being taken by governments, businesses and citizens in Canada. This role also involves co-ordinated actions with the United States. The Canadian government has the responsibility for funding cleanups on federal property and for conducting and funding much of the research needed to implement a cleanup program.

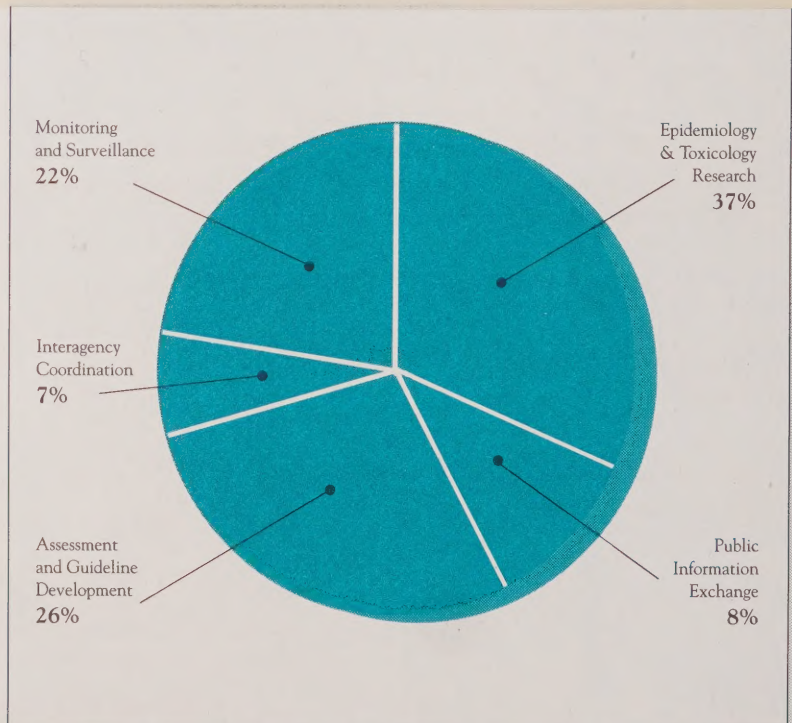
There are six federal departments with responsibilities for protecting the Great Lakes:

Environment Canada, Fisheries and Oceans Canada, Health and Welfare Canada, Transport Canada (Canadian Coast Guard), Agriculture Canada and Public Works Canada (dredging).

The work of the departments includes basic scientific research on the ecosystem, identifying pollutants and people at risk from pollution, passing and enforcing pollution laws and regulations, restoring and protecting wildlife habitat, regulating pesticides, working with farmers to reduce pollution and inspecting ships to avoid spills.

Federal Resources - Great Lakes Action Plan

Human Health Effects Program



THE GREAT LAKES ACTION PLAN

In 1989 the federal government announced it would spend a further \$125 million over five years under the Great Lakes Action Plan. The money will help clean up and maintain water quality as well as prevent future pollution of the lakes. Elements of the plan include:

- **\$55 Million Great Lakes Cleanup Fund**

Established in 1990, this fund is providing money to ensure the clean up of pollution sources within federal jurisdiction in the 17 Canadian Areas of Concern. These initiatives include: addressing the problem of contaminated sediments in federal harbors; dealing with historic wastes on federally-controlled lands; and, testing new cleanup techniques and technologies in programs with other government departments and the private sector. Managed by the Great Lakes Environment Office of Environment Canada, cleanup projects will be funded from late 1990 through to 1995. Environment Canada is the first agency to dedicate a specific fund to ensure that federal remedial measures in Areas of Concern can be started.

- **\$50 Million for a Great Lakes Preservation Program**

This program brings together the scientific and technological expertise of the federal departments of Environment, Fisheries and Oceans, Agriculture, Transport and Public Works to address Great

Lakes pollution. This includes such activities as research into the behaviour of contaminants mixed in water sediments and how they impact plant and fish life. Such knowledge is essential in order to decide how to deal with contaminated sediments in many of our industrialized harbors around the lakes.

Due to the large surface area of the lakes, the atmospheric deposition of toxic chemicals remains a problem. Canadian and American experts on air emissions, atmospheric chemistry and the measurement of wet and dry deposition of toxics are working together to establish and operate an integrated monitoring network around the Great Lakes. This network will provide measurements of the amount of toxics falling directly into the lakes.

Experts are also working to improve the ability to prevent and respond to spills from shipping accidents, not only to protect human life but to protect wildlife and their habitat.

The Preservation Program expands the fundamental scientific activities underlying water quality management to ensure the protection of the Great Lakes. This expansion is evident in the establishment of the Great Lakes University Research Fund. The four million dollar fund was established by agreement between Environment Canada and the Natural Sciences and Engineering Research Council specifically to engage the expertise of the university research community in direct support of Great Lakes water quality management needs.

HISTORICAL OVERVIEW

- 1909 Boundary Waters Treaty between Canada and the United States pledged both countries not to pollute boundary waters to detriment of the other side.
- 1955 Great Lakes Fishery Convention, which led to formation of Great Lakes Fishery Commission.
- 1972 Great Lakes Water Quality Agreement dealt mainly with phosphorus control to stop Lake Erie from "dying" of eutrophication.
- 1978 Great Lakes Water Quality Agreement introduced to ecosystem approach and the principle of zero discharge of toxic substances to the lakes.
- 1986 Canada-Ontario Agreement Respecting Great Lakes Water Quality co-ordinates federal and provincial actions to clean up the Great Lakes.
- 1986 Toxic Substances Control Agreement on the ecosystem among the eight Great Lakes states, Ontario and Quebec.
- 1987 Declaration of Intent on Pollution of Niagara River committed the governments of Canada, United States, Ontario and New York, to reduce certain toxic discharges to the river by at least half by 1996.
- 1987 Protocol to the 1978 Great Lakes Water Quality Agreement covered the development of Remedial Action Plans and such issues as toxic chemical deposition, leaking dumps and polluted runoff.
- 1988 St. Lawrence Action Plan announced by federal government to protect, conserve and restore the river's water quality.
- 1989 Great Lakes Action Plan announced by federal government to clean up and prevent future pollution of the lakes and to address existing and future health risks.

THE GREAT LAKES ACTION PLAN (cont'd)

- **\$20 million for a Human Health Effects Program**

The Department of National Health and Welfare is consulting extensively with Great Lakes communities and undertaking studies to get a better handle on the effects of toxic chemicals in the Great Lakes ecosystem on human health. The aim is to identify those populations most at risk and to find ways to protect them from pollution. Researchers will test people for chemical levels over a period of time and check for health problems that might be related to pollution. In particular they will be looking at the health of people who eat greater than average amounts of fish or other foods from the lakes. Researchers are particularly interested in the health of children, who are more vulnerable to many pollutants than are adults. People considered to be at risk will be advised on how they can reduce their exposure to pollution.

CANADIAN ENVIRONMENTAL PROTECTION ACT

The Canadian Environmental Protection Act (CEPA) has given the federal government stronger powers to control the use of hazardous substances throughout their life cycle. It is now being used to control the handling and discharge of a number of toxic substances, such as PCBs, dioxins and furans.

The program screens new chemicals for safety before they are allowed onto the market. It also reviews existing chemicals to see if they pose a threat to the environment and should be more tightly controlled.

FEDERAL PULP AND PAPER REGULATIONS

In 1990 the Federal Environment Minister announced a program that would require pulp and paper mills, including those on the Great Lakes - St. Lawrence system, to sharply lower their pollution discharges. New regulations under CEPA and the Fisheries Act will control the release of a wide range of harmful substances to the environment and virtually eliminate the release of dioxins and furans. They will require that the effluent of all mills be not acutely lethal to fish. Mills will have to be in compliance with the new standards by 1994.

THE ENVIRONMENTAL PARTNERS FUND

This five-year, \$50 million program, announced in June, 1989, pays for up to 50 per cent of an environmental project to a maximum federal contribution of \$200,000 over three years. It is aimed at groups wanting help in community-oriented environmental projects. Part of the money for this national program will be available for projects in the Great Lakes.

ST. LAWRENCE ACTION PLAN

The St. Lawrence River has long been heavily polluted, both by chemicals draining from the Great Lakes and from pollution added by cities, industries and farms in Quebec.

This great river is also the drinking water source for three million people and at times the water has been so polluted by raw sewage that there was a risk of infection.

The 1,200-kilometre-long river and its bottom muds are heavily laden with chemicals and it still has high levels of fresh human and animal wastes. In a major construction program, Quebec is building \$6.2 billion of sewage treatment plants along the St. Lawrence and its tributaries. It has also created a St. Lawrence River cleanup plan to make business development along the river environmentally acceptable, helping to restore the river to a healthy state.

In 1988 the federal government announced a \$110 million St. Lawrence Action Plan over five years to help reduce industrial pollution. The main objective is to reduce by 90 per cent the toxic liquid discharges into the river from the 50 industrial sites considered to be the biggest polluters. Another important goal is to protect 5,000 hectares (50 square kilometres) of vital wildlife habitat, especially wetlands, along the river.

Some of the money will also be used in the cleanup of federal properties, the protection of endan-

gered species, the development of environmental technologies, studies of St. Lawrence ecosystems, and the creation of a national marine park at the confluence of the Saguenay and St. Lawrence rivers to protect the area and the marine populations, especially the beluga whales.

The federal pollution control work involves work by the federal departments of Environment, Fisheries and Oceans, and Industry, Science and Technology. It involves collaboration with similar work being done by the Quebec government. As part of the action plan, the federal government created the St. Lawrence Centre.

CANADIAN COAST GUARD

Foreign organisms are transported into the Great Lakes in ballast water that ships pick up in one part of the world and dump in the lakes before they take on cargo. In order to prevent such unwanted invasions, the Canadian Coast Guard has voluntary guidelines asking all ships destined for the St. Lawrence Seaway and the Great Lakes to exchange ballast water at sea or in the St. Lawrence River. More than 1,000 sea-going ships enter the lakes each year. Some expert groups have said that it will require stronger controls to prevent ships from continuing the old practice of dumping water in the lakes. In 1990 Transport Canada began a program to monitor compliance with the guidelines to see if any changes are needed.

OTHER GOVERNMENTS

Much of the cleanup work around the lakes is the responsibility of Ontario and Quebec, the United States and the eight Great Lakes states bordering the basin.

Some projects are operated jointly. Agriculture Canada and the Ontario Ministry of Agriculture and Food are co-operating in the Soil and Water Environmental Enhancement Program (SWEEP). It helps farmers use agricultural techniques that reduce soil erosion in the Lake Erie basin. This will cut the amount of soil flowing into the lake, protecting agricultural lands for future generations and reducing the amount of fertilizers and pesticides that are carried into the lakes.

PROVINCIAL CONTROLS

Environment Ontario is bringing in one of the strictest water pollution control plans in Canada. The Municipal Industrial Strategy for Abatement (MISA) requires virtually zero discharge of persistent toxic substances into the province's waterways. MISA will regulate about 12,000 industries in the province as well as all municipal sewage discharges.

Ontario is also preparing a Clean Air Plan that will require the reduction of air pollutants that now fall on our waters.

The province's Food Systems 2002 program is aimed at helping growers reduce their use of pesticides by half and this will cut the amount of pesticides that can drain into waterways and the lakes. Ontario estimates this program will save farmers more than \$100 million in chemical costs.

SHARING RESPONSIBILITIES

The U.S. federal government, particularly the Environmental Protection Agency (EPA) and the eight Great Lakes state governments have spent large amounts of money on Great Lakes cleanups. The EPA office responsible for the Great Lakes has spent \$11 billion since 1972 and William Reilly, Administrator of the EPA, has said the Great Lakes area is one of the agency's top priorities.

The federal and state governments are using a series of laws to identify the sources of toxic discharges to the lakes to reduce those discharges. As in Canada, the federal and state governments are part of the process of developing Remedial Action Plans to clean up degraded areas.

INDUSTRIAL RESPONSES

Our waters will never be cleaned up without a major effort by industries. Until a few years ago most business leaders gave no indication that they felt a great need to change the long-standing practice of diluting wastes in water. Today the approach is changing and corporate leaders are now talking about major reductions or elimination of pollutants.

Since 1985, Dow Chemical Canada Inc. has spent millions of dollars to begin to disconnect its plants from the rivers and virtually eliminate further discharges to the Great Lakes - St. Lawrence system. Dow has cut the amount of 43 priority pollutants escaping from its Sarnia plants to the St. Clair River from 350 kilograms a day to about five kilograms a day. Much of this

was done by finding ways of preventing chemical leakage into the river.

In May, 1990, Dow separated the chemical cycle of its plant at Varennes, just east of Montreal, from the St. Lawrence River and is recycling water used in the factory. Dow is now working to separate its Sarnia chemical operations from the St. Clair River by the year 2000 or earlier in order to virtually eliminate the current emissions. ■



WHAT HAS TO BE DONE IN THE FUTURE

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

Our Common Future,
The World Commission
on Environment
and Development, 1987

THE TERM "SUSTAINABLE DEVELOPMENT" was popularized by the 1987 report of the World Commission on Environment and Development, the Brundtland Commission. It defines sustainable development as that which, "meets needs of the present without compromising the ability of future generations to meet their own needs."

It is a good phrase but difficult to practice, because eliminating or reducing our worst environmental impacts means making big changes in the way we live and do business. In the case of the Great Lakes and St. Lawrence this means restoring a seriously damaged ecosystem created by years of carelessness and neglect. This means finding ways of eliminating the discharge of toxic wastes.

We have a major effort ahead of us to identify populations that have been exposed to too much pollution and to help reduce their exposures. We must act now, working together for self protection, environmental preservation and cleanup.

We must learn to plan our activities in a way that anticipates and prevents problems rather than just treating and trying to cure them afterwards. We have to decide what kind of ecosystem we want for ourselves and our children. Do we want to be able to swim virtually anywhere, to eat fish and drink the water without worrying about impacts on our health? We must decide how clean our ecosystem should be. What future do we see for other species?

To a certain degree nature will cleanse the waters after we stop adding more pollution. If we stop polluting, sedimentation, evaporation, flushing and dilution will eventually reduce the severity of local toxic hotspots, bury pollution on the bottom of the lakes with fresh mud or flush chemicals into the Atlantic Ocean. But this will not happen overnight. It can take 190 years for water to move out of Lake Superior alone and another 30 years to reach the ocean. While this action will reduce chemicals in the lakes and rivers, it will spread them further into the world.

We must understand that sewage treatment plants are not equipped to deal with toxic chemicals and most of what goes down the drain will return to the lakes and eventually find its way into our food, air and drinking water.

Industries must install closed loop processes that do not release toxic substances. We must improve farming and land development practices to prevent pesticides from washing off the land. We must do a better job of making, handling and storing hazardous materials that now keep leaking into the waters.

Every citizen must realize that any waste that goes down the drain or into garbage will sooner or later pollute the environment. We have to become better environmental guardians and the best way to do this is to replace dangerous household chemicals with safe ones — consumer action!



To move towards a sustainable society we will have to make significant changes in the way we produce energy, use cars, farm produce, handle oil and chemicals and manage our forests. We will have to develop towns and cities in ways that reduce the daily discharge of wastes into the waters.

We must control the release of air pollution in Canada and work on international agreements to control pollution that travels from other nations. A number of environment-economy experts say this will require rich nations like Canada to subsidize pollution controls in developing nations in our common interest.

All these and other actions will help us reach a sustainable society. We have to participate in the debate and in actions. We can get more information and provide

our ideas through the Remedial Action Plans, the federal Green Plan and the sustainable development strategies of Round Tables on Environment and Economy at the national and provincial levels. ■

"The Governments of the United States and Canada clearly recognized the increasing importance of human health issues and their relation to ecosystemic health issues in the 1987 revisions to the Great Lakes Water Quality Agreement of 1978. The Board considers that the issues identified in the 1987 amendments have major implications for human and ecosystemic health and that there is a clear need for a comprehensive binational investigation, not limited to the Great Lakes basin, to address questions concerning the relationship between toxic ecosystems, people's exposure to toxic chemicals and health."

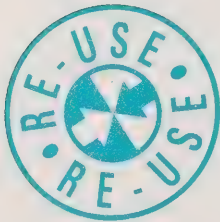
- from the 1989 Great Lakes Science Advisory Board Report to the International Joint Commission.

TO RESTORE AND PROTECT: WHAT YOU CAN DO TO SAVE THE ECOSYSTEM



AS CITIZENS OF THE WORLD, WE WHO live around the Great Lakes - St. Lawrence ecosystem have a responsibility to restore and protect one of the great sources of fresh water for the planet. As people who live with the waters we have a duty to protect water quality for ourselves, our children and other species of life. If we are going to have environmentally sustainable lifestyles, we will have to choose techniques, technologies and products that have a lower total impact on our environment.

- We can reduce our use of electricity and heating fuel at home, buy fuel-efficient cars and use cars less often, use fewer toxic chemicals in the home and garden and buy fewer throwaway products.
- By now most Canadians living around the Great Lakes - St. Lawrence ecosystem know about recycling and have a recycling box. This is just the start of a waste reduction, reuse and recycling program. You can speed the process by doing a waste inventory in your home, looking for hazardous products and disposing of them properly.
- You can reduce your demand below the average 300 litres of water, most of which gets quickly flushed down the drain, putting more strain on the water and sewer system.
- You can avoid flushing chemicals down the drain, thus adding a chemical load to somebody's source of drinking water. It is cheaper and safer to keep grease, hair and other solid wastes out of the drains than to pour toxic drain cleaners into the plumbing.



- Reduce or eliminate the use of lawn and garden chemicals that the rains wash into sewers and from there into the lakes. Even the wastes that go into landfill dumps can emerge after rain water seeps through the soil and dissolves hazardous materials.
- Do a better job of recycling at home and at the office. For example, Ontario has a target of 50 per cent recycling of wastes by the year 2000.
- Don't pour old paints and waste chemicals down your sinks or throw batteries and chemicals into the garbage. Get them into hazardous waste pickups by your municipality or the provincial government.

More and more books on how to prevent environmental problems are available from environment groups, governments, businesses and in bookstores. Environment Canada has published, *What We Can Do For Our Environment: Hundreds of things to do now.*

We can also play a personal role in helping to restore and protect our society. You can be involved in Remedial Action Plans for polluted areas in Ontario. A list of contacts is provided.

You can let people know what you want done to clean up the environment around our waters. Write or phone your elected officials, get your business or business association involved in reducing pollution and recycling. Contact environment groups that are trying to protect the Great Lakes and the rest of our environment.



FOR MORE INFORMATION PLEASE CONTACT

ENVIRONMENT CANADA

Environment Canada provides information on research and plays a key role in negotiations over cleanups involving several parties. It is involved in Remedial Action Plans and the Great Lakes Cleanup Fund.

For information about Great Lakes issues from Environment Canada, contact:

Great Lakes Environment Office
Conservation and Protection Service
Environment Canada, Ontario Region
6th Floor, 25 St. Clair Avenue East
Toronto, Ontario M4T 1M2
Tel (416) 973-8632

Communications Directorate
Environment Canada, Ontario Region
6th Floor, 25 St. Clair Avenue East
Toronto, Ontario M4T 1M2
Tel (416) 973-6467

The Environmental Partners Fund
Environment Canada, Ontario Region
3rd Floor, 25 St. Clair Avenue East
Toronto, Ontario M4T 1M2
Tel (416) 973-1076

THE ST. LAWRENCE ACTION PLAN

This is a program to help clean up the St. Lawrence River and protect environmentally valuable areas.

The St. Lawrence Centre
Environment Canada
105, rue McGill, Bureau 400
Montreal, Quebec H2Y 2E7
Tel (514) 283-7000

REMEDIAL ACTION PLANS

These are plans for the cleanup of polluted Areas of Concern around the Great Lakes.

For information on the RAP plan in general, contact:

Remedial Action Plans
Public Consultation Coordinator
Environment Canada, Ontario Region
6th Floor, 25 St. Clair Avenue East
Toronto, Ontario M4T 1M2
Tel (416) 973-9736

For more information about water quality issues in a specific Area of Concern call the Remedial Action Plan (RAP) coordinator for the area. Collect calls will be accepted.

Metro Toronto Waterfront
Tel (416) 424-3000

Hamilton Harbour
Tel (416) 336-4888

St. Marys River
Tel (Toll free) 1-800-265-0248

St. Clair River
Tel (Toll free) 1-800-265-0248

Detroit River
Tel (Toll free) 1-800-265-0248

Niagara River
Tel (416) 521-7720

St. Lawrence River
Tel (416) 973-9736

Peninsula Harbour
Tel (807) 475-1315

Jackfish Bay
Tel (807) 475-1205

Nipigon Bay
Tel (807) 475-1205

REMEDIAL ACTION PLANS (cont'd)

Thunder Bay
Tel (807) 475-1205

Collingwood Harbour
Tel (416) 323-4956

Severn Sound
Tel (416) 323-4956

Spanish Harbour
Tel (705) 675-4501

Wheatley Harbour
Tel (519) 661-2200

Bay of Quinte
Tel (613) 549-4000

Port Hope Harbour
Tel (416) 973-1060

HEALTH AND WELFARE CANADA

The federal department of Health and Welfare Canada is the lead agency in advising Canadians about risks from pollution and promoting the "healthy community" concepts. It monitors food safety, issues advisories and works with the provinces to develop drinking water guidelines.

For information about health and environment issues in general contact:

Publications Distribution Centre
Health and Welfare Canada
Room 512, Brooke Claxton Building
Tunney's Pasture
Ottawa, Ontario K1A 0K9
Tel (613) 952-9191

For information about the Great Lakes Health Effects Program contact: Health Protection Branch
Health and Welfare Canada
Environmental Health Directorate
Tunney's Pasture
Ottawa, Ontario K1A 0L2
Tel (613) 957-1876

DEPARTMENT OF FISHERIES AND OCEANS

The fisheries department is responsible for protecting fish from pollution and this has a direct bearing on water quality.

Department of Fisheries and Oceans
Communications Directorate
200 Kent Street West, Station 1478
Ottawa, Ontario K1A 0E6
Tel (613) 993-0999

CANADIAN COAST GUARD

The Coast Guard is responsible for safety of commercial vessels and is involved in preventing and cleaning up spills.

Canadian Coast Guard
Transport Canada
Central Region Headquarters
1 Yonge Street, 20th Floor
Toronto, Ontario M5E 1E5
Tel (416) 973-2162

AGRICULTURE CANADA

Agriculture Canada is responsible for regulating pesticides and working on water protection through soil conservation. For information contact:

Agriculture Canada
Sir John Carling Building
930 Carling Avenue
Ottawa, Ontario K1A 0C5
Tel (613) 995-5222

PUBLIC WORKS CANADA

This department has a responsibility in the cleanup of pollution on federal property. This includes using safe dredging techniques to remove contaminated sediments.

Public Works Canada
Place du Portage, Phase IV
140 Promenade du Portage
Ottawa, Ontario K1A 0M3
Tel (613) 997-7525

ONTARIO GOVERNMENT

Every year the Ontario Government publishes the Guide to Eating Ontario Sport Fish, a comprehensive listing of contaminants in sport fish. It lists the levels of mercury and hazardous chemicals in fish tested from hundreds of lakes and rivers around the province, including the Great Lakes. The free guidebook indicates which fish should be eaten in limited quantities or not at all.

It is available from:

The Ontario Government Bookstore
880 Bay Street
Toronto, Ontario M7A 1N8

Public Information Centre
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario M4V 1P5
Tel. (416) 323-4321

Public Information Centre
Ontario Ministry of Natural Resources
Room 1640, Whitney Block
Toronto, Ontario M7A 1W3
Tel (416) 965-2000

It is also available from most Liquor Control Board Outlets, Brewer's Retail outlets and some fishing licence vendors.

THE INTERNATIONAL JOINT COMMISSION

The International Joint Commission is a binational body that deals with boundary waters between Canada and the United States, especially the Great Lakes.

Information and reports on Great Lakes issues can be obtained from:

International Joint Commission
Great Lakes Regional Office
100 Ouellette Avenue, 8th Floor
Windsor, Ontario N9A 6T3
Tel (519) 256-7821

ENVIRONMENT AND ECONOMY ROUND TABLES

Round Tables have been appointed by the Prime Minister of Canada and Premiers of most provinces to help reach consensus on how to have both a healthy environment and a healthy economy.

The three that deal with the Great Lakes basin are:

National Round Table on the
Environment and the Economy
1 Nicholas Street, Suite 520
Ottawa, Ontario K1N 7B7
Tel (613) 992-7189

Ontario Round Table on Environment
and Economy
790 Bay Street
Suite 1003
Toronto, Ontario M7A 1Y7
Tel (416) 327-2032

Quebec Round Table on Environment
and Economy
Ministry of Environment
2360 chemin Ste-Foy, 1^{er} étage
Ste-Foy (Québec) G1V 4H2
Tel (418) 646-6590

MUNICIPAL GOVERNMENTS

A growing number of municipalities have environment committees and groups responsible for everything from the planning of waste disposal sites to recycling. Contact your municipal government, including the politicians, public works, waste management and waterworks and health departments for information on what they are doing to protect local water resources.

UNITED STATES

Since pollution often moves across boundaries, actions in the United States often have an impact in Canada.

Great Lakes Fishery Commission
1451 Green Road
Ann Arbor, Michigan 48105 U.S.A.
Tel (313) 662-3209

For information about U.S. Federal pollution controls, contact:

Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604 U.S.A

Environmental Protection Agency
Region II
26 Federal Plaza, Room 900
New York, N.Y. 10278 U.S.A.

CITIZEN GROUPS

Non-government groups have often alerted the public to the seriousness of environmental issues and have worked with governments and some businesses to find solutions. They are a valuable source of information on Great Lakes and other environment issues. Some of the groups dealing

with Great Lakes - St. Lawrence issues include:

Great Lakes United (binational)
State University College
Cassettey Hall
1300 Elmwood Avenue
Buffalo, N.Y. 14222
Tel (716) 886-0142

Pollution Probe Foundation
12 Madison Avenue
Toronto, Ontario M5R 2S1
Tel (416) 926-1907

Canadian Environmental Law
Association
517 College Street, Suite 401
Toronto, Ontario M6G 4A2
Tel (416) 960-2284

Conservation Council of Ontario
489 College Street, Suite 506
Toronto, Ontario M6G 1A5
Tel (416) 969-9637

Greenpeace - Toronto Regional
Office
578 Bloor Street West,
Toronto, Ontario M6G 1K1
Tel (416) 538-6470

Great Lakes Tomorrow
720 Bathurst Street, Suite 403
Toronto, Ontario M5S 2R4
Tel (416) 536-9161

The Centre for the Great Lakes
(Toronto office)
320 1/2 Bloor Street West, Suite 301
Toronto, Ontario M5S 1W5
Tel (416) 921-7662

Société pour vaincre la pollution
C.P 65, succursale Place d'Armes
Montréal (Québec) H2Y 2T1
Tel (514) 844-5477 ■

READING LISTS

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Science Council of Canada, *Water 2020, Sustainable Use for Water in the 21st Century*, Report 40, Ottawa, 1988.

World Commission on Environment and Development, *Our Common Future* (the Brundtland Report), Oxford, 1987.

For additional copies of this
publication contact:

Environment Canada
Communications Directorate, Ontario Region
25 St. Clair Avenue East, 6th Floor
Toronto, Ontario
M4T 1M2
(416) 973-6467

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